CLAIMS

What is claimed is:

1. A method for cleaning silicon carbide materials on a large scale, the method comprising the acts of:

using an integrated system that is adapted for handling a multiplicity of said silicon carbide materials during said cleaning;

ultrasonicating said silicon carbide materials in an aqueous solution of inorganic acid; and

ultrasonicating said silicon carbide materials in a bath of deionized water.

2. The method of Claim 1, wherein said silicon carbide materials are sintered.

3. The method of Claim 1, wherein said silicon carbide materials are formed using chemical vapor deposition (CVD).

4. The method of Claim 1, further comprising the act of oxidizing said silicon carbide materials.

5. The method of Claim 4, wherein the act of oxidizing comprises using a temperature from about 800 degrees Celcius to about 1500 degrees Celcius.

6. The method of Claim 1, further comprising the act of scrubbing said silicon carbide materials.

7. The method of Claim 6, further comprising the act of contacting said silicon carbide materials in a dilute aqueous solution of inorganic acid after ultrasonicating said silicon carbide materials in said bath of deionized water.

8. The method of Claim 1, wherein said aqueous solution of inorganic acid is selected from said group consisting of $HF:HNO_3:H_2O$ and $HF:H_2O_2:HNO_3$.

9. The method of claim 1, wherein said aqueous solution of inorganic acid comprises:
5%-20% wt. HF;
20%-95% wt. HNO_3; and
0%-80% wt. H_2O.

10. The method of claim 1, wherein a temperature of said aqueous solution of inorganic acid is maintained from about 20 degrees Celcius to about 50 degrees Celcius.

11. The method of claim 1, wherein the act of ultrasonicating said silicon carbide materials in said aqueous solution of inorganic acid is performed for a duration of time from about 10 minutes to about 15 minutes.

12. The method of claim 1, wherein the act of ultrasonicating said silicon carbide materials in said aqueous solution of inorganic acid is performed at a power from about 30 watts per gallon to about 50 watts per gallon.

13. The method of claim 1, wherein the act of ultrasonicating said silicon carbide materials in said aqueous solution of inorganic acid is performed at an ultrasonic frequency from about 25 Kilo-hertz to about 40 Kilo-hertz.

14. The method of claim 1, wherein the temperature of said bath of deionized water is maintained from about 20 degrees Celcius to about 50 degrees Celcius.

15. The method of claim 1, wherein the act of ultrasonicating said silicon carbide materials in said bath of deionized water is performed for a duration of time from about 30 minutes to about 61 minutes.

16. The method of claim 1, wherein the act of ultrasonicating said silicon carbide materials in said bath of deionized water is performed at a power intensity from about 80% to about 90% of 40 watts/gallon.

17. The method of claim 1, wherein the act of ultrasonicating said silicon carbide materials in said bath of deionized water is performed at an ultrasonic frequency from about 27 Kilo-hertz to about 40 Kilo-hertz.

18. The method of claim 1, wherein the act of ultrasonicating said silicon carbide materials in said bath of deionized water is performed at a power from about 30 watts per gallon to about 50 watts per gallon.

19. The method of Claim 1, further comprising the act of baking said silicon carbide materials.

20. The method of Claim 19, wherein the act of baking comprises using a temperature of about 200 degrees Celcius to about 300 degrees Celcius.

21. The method of Claim 19, wherein the act of baking is performed for a duration of time from about 2 hours to about 3 hours for silicon carbide wafer-rings and silicon carbide wafer-lift pins.

22. The method of Claim 19, wherein the act of baking is performed using a nitrogen purge oven.

23. The method of Claim 19, wherein the act of baking is performed using a convection oven.

24. The method of Claim 19, wherein the act of baking is performed using a vacuum oven.

25. The method of Claim 1, further comprising the act of purging said silicon carbide materials in a nitrogen gas stream.

26. The method of Claim 25, wherein the act of purging said silicon carbide materials in said nitrogen gas stream is performed at a pressure from about 10 psi to about 20 psi.

27. The method of Claim 1, further comprising the act of soaking said silicon carbide materials in said aqueous solution of inorganic acid.

28. The method of Claim 27, wherein said aqueous solution of inorganic acid is selected from said group consisting of $HF:HNO_3:H_2O$ and $HF:H_2O_2:HNO_3$.

29. The method of claim 27, wherein said aqueous solution of inorganic acid comprises:
5%-20% wt. HF;
20%-95% wt. HNO_3; and
0%-80% wt. H_2O.

30. The method of claim 27, wherein a temperature of said aqueous solution of inorganic acid is maintained from about 20 degrees Celcius to about 50 degrees Celcius.

31. The method of Claim 7, wherein said dilute aqueous solution of inorganic acid is selected from said group consisting of $HF:HNO_3:H_2O$ and $HF:H_2O_2:HNO_3$.

32. The method of claim 31, wherein said dilute aqueous solution of inorganic acid comprises
0.5%-1.5% wt. HF;
1%-10% wt. H_2O_2; and
0.1%-0.5% wt. HNO_3.

33. The method of claim 7, wherein a temperature of said dilute aqueous solution of inorganic acid is maintained from about 20 °C to about 50 °C.

34. The method of claim 1, wherein said integrated system includes chemically resistant materials that are flexible.

35. The method of claim 1, wherein said integrated system includes robotic mechanisms.

36. The method of claim 34, wherein said chemically resistant materials includes high-density polyethylene.

37. The method of claim 1, wherein said integrated system is adapted for handling silicon carbide wafer-lift pins.

38. The method of claim 37, wherein said integrated system includes one or more a pin-racks adapted for holding said silicon carbide wafer-lift pins.

39. The method of claim 1, wherein said integrated system is adapted for handling silicon carbide wafer-showerheads.

40. The method of claim 1, wherein said integrated system is adapted for handling silicon carbide wafer-rings.

41. The method of claim 40, wherein said integrated system includes one or more wafer boats adapted for holding said silicon carbide wafer-rings.

42. The method of claim 1, further comprising using a peristaltic pump and a manifold for cleaning interior surfaces of hollow silicon carbide wafer-lift pins.